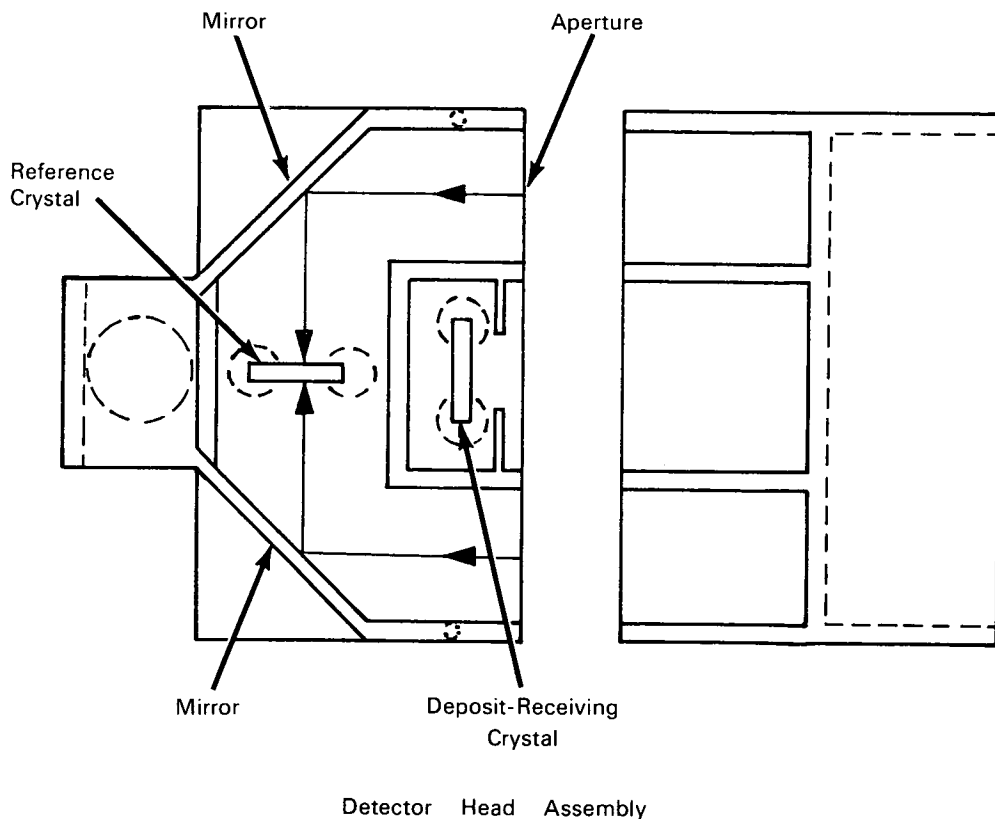


# NASA TECH BRIEF



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## Deposition Monitor and Control



### The problem:

The evaporation process of thin films requires a method to monitor and control the thickness of the film and rate of deposition. A common procedure of measuring the film thickness is to monitor the frequency change of a quartz crystal oscillator as the film mass is deposited on the crystal. The temperature change of the crystal, introduced by the addi-

tional heat of the deposited mass, results in errors due to drift in the output detector.

### The solution:

Two quartz crystal oscillators were used to monitor the deposition rate. One was exposed directly to the deposition which added mass and heat; the other was exposed only to the heat. The outputs of both oscillators were mixed and the difference frequency (free of

the drift due to the heat) was used as the indication of the film thickness.

**How it's done:**

In the figure it is seen that the reference crystal is mounted transversely in a channel that terminates in the two outer apertures; it is in optical communication with the two mirrors and to the outer environment through the apertures. The deposit-receiving crystal is located behind the central aperture and can receive both the film deposition and the emitted radiation.

The difference in frequency between the oscillators associated with the two crystals results in a beat frequency which is used to generate a square wave output at the difference frequency. This signal output is conditioned in the electronics so that the output frequency is directly related to the deposited film thickness.

**Note:**

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer  
NASA Pasadena Office  
4800 Oak Grove Drive  
Pasadena, California 91103  
Reference: B69-10722

**Patent status:**

No patent action is contemplated by NASA.

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